

REMARKS

Claims 1, 2, 5, 20-23, 26-31, 34, 37, 45-50, 53, 56, 64-66 and 78-81 have been amended. Claims 1-81 remain pending. Applicant reserves the right to pursue the original claims and other claims in this and other applications. Applicant respectfully requests reconsideration of the above-referenced application in light of the amendments and following remarks.

Claims 1-81 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 62278432 A ("Hoshi"). The rejection is respectfully traversed.

Hoshi does not teach or suggest an image sensor pixel comprising, "a semiconductor substrate; a photoconversion device formed within said semiconductor substrate; a dielectric layer formed over said photoconversion device; and a mesh optical filter positioned over said dielectric layer and photoconversion device for passing light of a specific wavelength to said photoconversion device," as recited in claim 1.

Hoshi does not teach or suggest an image sensor pixel comprising, "a semiconductor substrate; a photoconversion device formed within said semiconductor substrate; a dielectric layer formed over said photoconversion device; a first mesh optical filter positioned over said dielectric layer and photoconversion device for passing light of a specific wavelength to said photoconversion device; and at least one additional mesh optical filter positioned over said first mesh optical filter for passing light of a specific wavelength to said photoconversion device," as recited in claim 21.

Hoshi does not teach or suggest an image sensor comprising, "an array of pixels, each pixel comprising a photoconversion device and a dielectric layer formed over said photoconversion device; and a plurality of metal mesh optical filters

respectively formed over said pixels, each metal mesh optical filter passing light of one of three colors to a respective photoconversion device," as recited in claim 26.

Hoshi does not teach or suggest an image sensor system comprising, "an array of pixels, each pixel comprising a photoconversion device and a dielectric layer formed over said photoconversion device; and a plurality of metal mesh optical filters formed over said pixels, each metal mesh optical filter passing light of one of a plurality of colors to a respective photoconversion device," as recited in claim 45.

Hoshi does not teach or suggest a method of forming an image sensor pixel cell comprising, "forming a photoconversion device within a semiconductor substrate; forming a dielectric layer over said photoconversion device; and forming a mesh optical filter over said dielectric layer and photoconversion device for passing light of a specific wavelength to said photoconversion device," as recited in claim 64.

Similarly, Hoshi does not disclose or suggest a method of forming an image sensor comprising, "forming an array of pixels, each pixel comprising a photoconversion device and a dielectric layer formed over said photoconversion device; and forming a plurality of metal mesh optical filters over said pixels, each metal mesh optical filter passing light of one of three colors to a respective photoconversion device," as recited in claim 78.

Hoshi does not teach or suggest an image sensor pixel or its method of formation having a dielectric layer formed over a photoconversion device, and a mesh optical filter formed over the dielectric layer and photoconversion device. The present invention relates to a *solid-state* imager sensor having arrayed pixel cells, and methods of formation.

Hoshi relates to a plasma light detector having a radio wave filter structure consisting of three discrete filters, one of which is a copper mesh filter 2. The other filter in Hoshi, *i.e.*, filter 3, is used to cut off *noise* signals generated by radio waves. Hoshi's copper mesh filter 2 is the only optical filter used for cutting off short wavelength light. The fact that Hoshi's device is used for filtering radio waves is further confirmed by element 4 which is described as an "*antenna*." (Abstract) (emphasis added). For example, Hoshi discloses that the "light receiving element 4 is used as an *antenna*." (Abstract) (emphasis added).

Thus, according to the machine translation that was attached to the Office Action, Hoshi discloses, in FIG. 1, "[l]ight to be measured of a *plasma* entering at an incidence window 1 which serves as filter for cut off short wavelength range while vacuum sealing up the inside of a detector section is transmitted through filters 2 and 3 arranged sequentially." (Abstract) (emphasis added). Filter 2 consists "of a copper mesh deposited on a *sapphire plate* . . . in the measurement of *plasma* and a reflectance enough to cut off *noise signals*." (Abstract) (emphasis added).

As a result, Hoshi does not disclose an image sensor, an image sensor pixel (or their methods of formation) comprising, *inter alia*, a dielectric layer formed over a photoconversion device in a semiconductor substrate, much less a mesh or metal mesh optical filter formed over the dielectric layer and photoconversion device. As indicated above, the present invention relates to a solid-state imager with pixel cells having a photosensitive region. Hoshi discloses a plasma light detector having a radio filtering structure consisting of two discrete filters.

Hoshi does not disclose a semiconductor substrate having a photoconversion device, much less a dielectric layer formed over a photoconversion device, and Hoshi certainly does not teach a mesh optical filter or metal mesh optical filter formed over the dielectric layer and photoconversion device, as recited in independent claims 1, 21, 26, 45, 64 and 78.

Claims 2-20 depend from claim 1 and should be allowable with claim 1 for at least the reasons provided above regarding claim 1, and on their own merits. Claims 22-25 depend from claim 21 and should be allowable with claim 21 for at least the reasons provided above regarding claim 21, and on their own merits. Claims 27-44 depend from claim 26 and should be allowable with claim 26 for at least the reasons provided above regarding claim 26, and on their own merits. Claims 46-63 depend from claim 45 and should be allowable with claim 45 for at least the reasons provided above regarding claim 45, and on their own merits. Claims 65-77 depend from claim 64 and should be allowable with claim 64 for at least the reasons provided above regarding claim 64, and on their own merits. Claims 79-81 depend from claim 78 and should be allowable with claim 78 for at least the reasons provided above regarding claim 78, and on their own merits.

With regard to dependent claims 3, 4, 35, 36, 54, and 55, the Office Action acknowledges that Hoshi does not "explicitly refer to the photodetector being utilized in a CMOS or CCD image sensor, but such would have been obvious to one of ordinary skill in the art because both are low cost imaging detectors that are easy to manufacture." (p. 3). Hoshi's apparatus and methods, however, as noted above, are directed to detecting plasma light and radio wave filtering. Hoshi is not directed to a solid-state image sensor. Accordingly, there are no image sensor pixels in Hoshi's structure.

Applicant notes that “[i]n order to rely on a reference as a basis for rejection of an applicant’s invention, the reference must either be in the field of applicant’s endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned.” *In re Oetiker*, 977 F.2d 1443, 1446 (Fed. Cir. 1992); M.P.E.P. § 2141.01(a).

A structure, as disclosed in Hoshi, that is used to detect plasma light with a single light detector and which filters for radio waves using an antenna is not reasonably pertinent to problems associated with solid-state imager devices, such as CMOS or CCD imaging devices, as recited in claims 3, 4, 35, 36, 54, and 55. Applicant’s field, CMOS and CCD solid-state imaging devices, and Hoshi’s field, a plasma light detector which filters radio waves with an antenna, involves entirely distinct problems and solutions. Therefore, nothing commends looking at Hoshi’s field, to an inventor attempting to improve CMOS or CCD imaging devices. See M.P.E.P. § 2141.01(a).

Still further, Applicant respectfully submits that the Office Action has failed to set forth a *prima facie* case of obviousness with regard to claims 3-4, 6-7, 9-19, 21-63, 67-68, and 70-81. See M.P.E.P. § 2143. “To establish *prima facie* obviousness of a claimed invention, *all* the claim limitations must be taught or suggested by the prior art.” M.P.E.P. § 2143.03 (emphasis added). As the Office Action acknowledges, there are many elements that Hoshi does *not* disclose or suggest. The Office Action merely and summarily concludes that the elements recited in the dependent claims would have been obvious or a matter of routine optimization.

However, “[a] statement that modifications of the prior art to meet the claimed invention would have been ‘well within the ordinary skill of the art’ at the time the claimed invention was made because the [reference] relied upon teach that all aspects of the claimed invention were individually known in the art is *not sufficient* to

establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references." M.P.E.P. § 2143.02. As a result, Applicant respectfully submits that the Office Action has failed to set forth a *prima facie* case of obviousness.

The Office Action acknowledges that Hoshi, with respect to dependent claims 3, 4, 35, 36, 54, and 55, does not disclose or suggest a photodetector used in a CMOS or CCD image sensor; but, concludes that it would have been obvious to incorporate Hoshi's structure into one (p. 3). Applicant respectfully submits that the Office Action's suggestion *cannot* be done, *i.e.*, Hoshi's invention cannot be used in a CMOS or CCD solid-state image sensor. Hoshi does not deal with an image sensor pixel. Hoshi's device is a plasma light detector, and it is *not* an image sensor, and it therefore *cannot* be used in an image sensor. There are no image sensor pixels in Hoshi's structure, and there is no teaching or suggestion of how Hoshi's device could be used in a CMOS or CCD solid-state image sensor.

The Office Action acknowledges that Hoshi, with respect to claims 7-8, does not disclose or suggest the thicknesses of the metal layers; but, concludes that it would have been a matter of obvious design choice to ensure that the copper filter 2 filters out appropriate wavelengths of light (p. 3). However, Hoshi does not teach or suggest *any* thicknesses for a metal layer. Moreover, since Hoshi illustrates a plasma light detector structure with discrete filters filtering radio waves, the metal layers would not have the thicknesses claimed which are associated with an *integrated circuit* structure.

The Office Action acknowledges that Hoshi, with respect to claims 9-11 and 13-16, does not disclose or suggest the shape or size of the apertures; but, concludes that it would have been a matter of obvious design choice to allow certain amounts of light to be incident on the detector. However, Hoshi does not teach or suggest *any* sizes

for an aperture. Since the mesh disclosed in Hoshi filters radio waves, it could have apertures so large that no light filtering on a *semiconductor* level can occur.

The Office Action acknowledges that Hoshi, with respect to claims 21 and 22, does not disclose or suggest an additional mesh optical filter formed over the first mesh optical filter; but, merely concludes that it would have been obvious. Hoshi, however, only discloses a *single* mesh filter. Hoshi does *not* teach or suggest that the *other* filter is a mesh filter, much less an optical mesh filter.

The Office Action acknowledges that Hoshi, with respect to claim 23, does not disclose or suggest patterning and depositing a layer to interconnect image sensor circuitry; but, merely concludes that it would have been obvious to give the filters ability to be controlled electrically. Again, Hoshi's device is a light detector for *plasma* light, and it is *not* an image sensor. Therefore, there are no image sensor pixels in Hoshi's structure. As such, Hoshi's structure would not be used to interconnect image sensor circuitry.

The Office Action acknowledges that Hoshi, with respect to claim 26, does not disclose or suggest an array of pixels or plurality of mesh optical filters; but, merely concludes that it would have been obvious as a matter of obvious duplication of parts to allow a device to image a larger area with greater sensitivity. Hoshi's radio filtering device is a plasma light detector structure with discrete filters filtering radio waves, and it is *not* an image sensor. Therefore, there are no array of image sensor pixels in Hoshi's structure. Hoshi does not teach a single image sensor pixel, much less an array.

The Office Action acknowledges that Hoshi, with respect to claim 29, does not disclose or suggest the use of a Bayer pattern; but, merely concludes that it would have been obvious to "randomize the location of different color filters." Again, Hoshi's

invention relates to a plasma light detector and is not an image sensor pixel. There is no motivation to use a Bayer pattern with Hoshi's plasma light detector. Since Hoshi does not disclose an solid-state imaging structure, there is no need or use for a Bayer pattern. In addition, Hoshi does not teach or suggest *color filters* as the Office Action indicates.

For the sake of brevity, Applicant respectfully submits that the other dependent claims should be allowable for similar reasons provided above. Hoshi simply does not teach or suggest an image sensor pixel or an array of pixels, and their methods of formation. Hoshi apparatus and methods relates to an invention with radio waves. Hoshi's radio filtering device is used as a light detector for *plasma* light, and it is *not* an image sensor. Therefore, there are no pixels or image sensor pixels in Hoshi's structure. Consequently, structures and methods pertaining to the formation of an image sensor would not be obvious in forming a structure relating to radio waves.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to review and pass this application to issue.

Dated: November 17, 2005

Respectfully submitted,

By 

Thomas J. D'Amico

Registration No.: 28,371

DICKSTEIN SHAPIRO MORIN &

OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorney for Applicant